

# **RECOMMENDATIONS FOR FIRE STATION DESIGN**

## **EXECUTIVE DEVELOPMENT**

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## **ABSTRACT**

The City of Clearwater, Florida, has experienced considerable growth during the past twenty years. As a result, Clearwater Fire and Rescue was recommending that the City build two additional fire stations to better serve the increased population. The problem was Clearwater had not built or refurbished a fire station since 1978.

The purpose of this research was to develop fire station design recommendations that would meet the needs of future construction projects. The action research method was utilized to research the following questions:

1. What design changes have taken place over the last twenty years to improve station functionality?
2. To what guidelines must new construction or refurbishment adhere?
3. What are fire departments in Pinellas County doing to meet their needs?

The literature review examined current trends in fire station design and the suggested guidelines for new construction. Data was also gathered by interviewing John C. Kelly, a local architect. Fire stations located in Pinellas County which had been built or refurbished within the past two years were visited.

The findings of this research indicate the need to address an ever growing coed workforce in the area of station design. The National Fire Protection Association's 1500 Series is an excellent guide to meeting health and safety issues when designing a fire station. Movement has been away from an institutional building design by incorporating the features found in residential design. Research findings were instrumental in the development of a facilities checklist (Appendix A) and a list of building prerequisites (Appendix B).

The recommendations resulting from this research are to address coed facilities and incorporate NFPA 1500 Series criteria into any future construction projects. Recommendations are also included regarding fire station features designed for use when threatened by a hurricane.

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## INTRODUCTION

During the spring of 1999, the elected officials, management team, and citizens of the City of Clearwater, Florida, were made aware of the needs of its Fire and Rescue Department.

Clearwater's fire stations are aging and there has been considerable growth since 1978, the year in which the newest station was built. Along with a plan to refurbish existing stations, two new fire stations have been proposed.

The problem that prompted this research project was that Clearwater Fire and Rescue had not built or completely refurbished a fire station since 1978. The community was now aware of our needs and prepared to act; however, we are in need of recommendations that could be incorporated into our design plan.

The purpose of this research was to develop fire station design recommendations that would meet the needs of Clearwater Fire and Rescue in future station construction and refurbishment projects. The action research method was used. The following research questions were posed:

1. What design changes have taken place over the last twenty years to improve station functionality?
2. To what guidelines must new station construction or refurbishment adhere?
3. What are Fire Departments in Pinellas County doing to meet their needs?

## **BACKGROUND AND SIGNIFICANCE**

On October 1, 1999, the City of Clearwater, Florida, began its budget year with a 0.4 mill increase to taxpayers. This was the first millage increase to taxpayers in eight years. There had been little planning by prior fire administrations and City leaders for future needs regarding fire stations, personnel, and apparatus.

During the past two years many changes have taken place in the make-up of our commission/city manager form of government. In the spring of 1997 the City hired a new City Manager, Mr. Michael Roberto. Mr. Roberto has since made several changes to senior management staff, and William Horne and Robert Keller were hired as Assistant City Managers. Other changes that took place in March of 1999 include a newly elected Mayor, Mr. Brian Aungst, and a new commissioner, Mr. Ed Hart. Now was the time to move forward to address the needs of Clearwater Fire and Rescue.

Early in his tenure, Mr. Roberto met with then Interim Fire Chief Rowland E. Herald to discuss having an independent consultant perform a management study of Clearwater Fire and Rescue. On March 19, 1998 the Clearwater City Commission awarded a contract to Richard A. Knopf & Associates, Inc. to conduct a complete fire services management study of Clearwater Fire and Rescue.

The firm of Richard A. Knopf & Associates is a Texas corporation providing municipal consulting services in the area of public safety. Dick Knopf, company president, is a retired fire chief, having served for thirty years in five cities. Eighteen of those years were as Fire Chief in three communities, one of which is smaller than Clearwater, one approximately the same size, and one larger than Clearwater. The second consultant on the Clearwater assignment was James Roberts, who served with

Midland, Texas Fire Department, a city the same size as Clearwater, for 36 years, 13 years as Fire Chief.

According to Knopf, “In the process of the study, it became clear that the Clearwater Fire and Rescue Department had been seriously handicapped in the past due to budget constraints, some of which were artificially created. As a result, the infrastructure has not been maintained and updated in a fashion which will allow the Fire Department to provide both excellent service and a productive work environment for its employees.” (Knopf, 1998, pg. 4).

The next step was to educate the City management, elected officials, and the citizens about Clearwater Fire and Rescue and its needs.

### **Clearwater Fire and Rescue**

The City of Clearwater, Florida, has grown rapidly both as a tourist destination and as a business center. Clearwater is located on the west coast of Florida, and is the County seat of Pinellas County.

The Department, in its effort to protect and serve both the citizens of Clearwater and those County citizens in the unincorporated area of the Clearwater Fire District responds to over 21,500 calls for assistance each year, of which over 85% are medical emergencies. The assigned fire protection district is about 42.5 square miles in area and serves a permanent population of 114,500. The Department has six fire stations strategically located to provide three-to-five minute responses to incidents. The total staff under the Fire Chief’s supervision is 181 and includes a fiscal year budget of approximately 13 million dollars (City of Clearwater. Office of Management and Budget,

1999, p.87).

The main strength of Clearwater fire stations is their location. While their conditions are less than desirable, the locations for the six stations are appropriate, when supplemented by two additional facilities. (Knopf, 1998, pg. 35). The recommended locations of the two proposed fire stations would be in the northwest section of the City of Clearwater and on the island of Sand Key.

The City Manager and elected officials agreed to allow Clearwater Fire and Rescue to temporarily staff an Advance Life Support (ALS) unit on Sand Key (a barrier island) connected by bridge to Clearwater Beach. This unit is staffed with two personnel and runs out of a United States Coast Guard facility.

At the present time the City Commission has appointed a Fire Task Force to identify and recommend a funding solution for the Fire Department five-year Master Plan. These recommendations are to include capital projects such as additional stations, station refurbishment, and staffing. The outcome of the Sand Key station, whether it be temporary, long-term or not at all will hinge on this panel's recommendations.

The Fire Task Force panel has the following make-up: Fire Chief Rowland E. Herald, Union President John Lee, Local 1158 International Association of Firefighters (IAFF), and nine citizens, Fran Briskman, Joe Calio, Joe Evich, Russ Kimball, George Krause, Scott Nall, Bill Schwob, William Sherman, Duke Tieman, and Chaired by Assistant City Manager William Horne, who is a non-voting member. The Task Force is to present its recommendations to the City Commission in January of 2000.

The recommendations of the Fire Task Force will impact the future of Clearwater

Fire and Rescue greatly. Irregardless of a recommendation for additional fire stations, the six existing stations will need much refurbishing. This research will provide Clearwater Fire and Rescue with some insight for future consideration in the area of fire station design.

This research brief was completed in accordance with the applied research guidelines of the National Fire Academy's Executive Fire Officer Program. The issue addressed by the research relates specifically to Unit 7 of the *Executive Development* course, titled "Organizational Culture." This unit addresses changes the fire service must make to meet the needs of the community. The Fire Task force will make recommendations as to Clearwater Fire and Rescue's needs and the intent of this research is to help expedite anticipated results. The issue also relates to Unit 8 of the Executive Development course titled "Ethics." Employers have an ethical responsibility to provide a safe work environment. By adhering to the many changes in fire station design over the past 20 years, the goal is to make the work environment safer and much more functional.

## **LITERATURE REVIEW**

The literature review began with a comprehensive review of information that focused on station design and planning, guidelines, and inquires of regional departments.

### Research Question 1:

**What design changes have taken place over the last twenty years to**

## **improve station functionality?**

Issues of key importance include, but are not limited to, an expanding number of female personnel, and health and safety issues. There's no one answer, it seems, to coed housing questions. As stated by Hans Kahn of Denver-based Hans Kahn Associates Inc., "Now the whole notion of discrimination against women firefighters has led us to the point where we design equal facilities so, regardless of the mix of men and women on any given shift, no one is going to feel discriminated against. That sounds like a great idea, but there's money involved in doing that. It does add cost." (Elliott, 1999, pg. 5)

John Kelly, an architect with Fleischman/Garcia in Tampa, Florida, states that they are designing stations with separate cubicles for sleeping, approximately 8' x 10' containing three lockers and a desk. They are also utilizing a pull curtain for the doorway to enhance privacy. (Fleischman/Garcia).

Coed housing issues don't stop with sleeping arrangements. Mary McGrath of the RRM Design Group in San Luis Obispo, California, breaks the locker room/restroom issue down into three basic options:

- Separate but equal;
- Separate but unequal; or
- Gender neutral.

In each case the trend is toward residential-style layout. (Elliott, 1999, pg. 6) To quote Mitch Connor of RMV Architecture + Design in Santa Rosa, California, "Instead of having big gang bang showers and large toilet rooms, where you might have two or three lavatories, two toilets and three showers, we're putting in what looks like a

residential shower/toilet room. You do three or four of those. That way, one-person goes in, locks the door, and that seems to calm everybody down. But that costs more money because you have to create these separate rooms.” (Elliott, 1999, pg. 6)

Health and safety considerations for firefighters, their colleagues and their families have resulted in an aggressive approach to decontamination in the firehouse. “An important space that we didn’t used to have to provide for is a decontamination room,” states Stephen Knarr of Horner & Shifrin a St Louis firm. Knarr goes on to say, “With the new National Fire Protection Association (NFPA) guidelines about proper decon after a call, we’ve been seeing more and more districts ask for a separate decon space right off the apparatus bay that has showers and a commercial laundry in it.” (Elliott, 1999, pg. 4) Mary McGrath says her firm uses different floor surfaces as demarcations for decon. “We’re trying to get them set up where if you go into carpet, you don’t have any turnout gear on. Once you go across to the living area, [the gear] should be in an alcove off the apparatus bay or right out where the apparatus are.” (Elliott, 1999, pg. 4)

“The biggest change we’ve seen in the past 10 years is this idea of using more compartmentalized space – smaller dorm rooms, smaller toilet rooms – and beginning to treat the station more like a house,” states Mitch Connor. Connor goes on to say, “You’re with people for 24 hours, and you need the ability to get away sometimes, to study or read a book or just be by yourself. If you look at a lot of the older fire stations, they’re very institutional looking: big rooms, big dormitories, and big dining halls. That’s not a very pleasant environment to be in for long periods of time.” (Elliott, 1999, pg. 5)

The emphasis on firefighter health and fitness has led to extensive exercise

facilities in fire stations across the nation. Their state-of-the-art room is their physical training room. (Elliott, 1999, pg. 5)

As in many homes, the kitchen is a focal point in most fire stations. Oakland, California, Architect Don Dommer suggests separate refrigerators and dry storage areas for each shift. (Elliott, 1999, pg. 5)

Nearly all the architects agree that finding just the right mix of grit on the floor plate is difficult. Too little grit and boots hydroplane across the floor; too much grit and you get a floor you can't clean. (Elliott, 1999, pg. 4) Apparatus bay floors necessitate ruffed yet slip resistant surfaces. (FA 168, 1997, pg. 34)

Sprinkler systems are not required for this type of building. Fire stations are not immune from the threat of fire, and it would be embarrassing to have yours burn down. Katia Thomas with Pahl-Pahl-Pahl Architects/Planners states, "We recommend them and usually install them. We have also done stations with automatic shut-offs to the gas on the stove and to the barbecue grill outside. It can be overridden just by hitting a button on the wall." (Elliott, 1999, pg. 6)

Security issues have changed over the past five to eight years. We're seeing more and more fire stations becoming symbols of governmental presence, and so we are trying to design safety features into them. Wayne Hughes states, "Not only active security such as cipher locks and video cameras, but also angled window sills, so incendiary devices can't be placed next to windows. That and making sure the command center in a fire station is at the front door." (Elliott, 1999, pg. 6, 7)

Across the country, architects are suggesting everything from skylights to patios with gas grills to make the workplace feel more like home. (Elliott, 1999, pg. 4)

Research Question 2:

**To what guidelines must new station construction or refurbishment adhere?**

John C. Kelly, an architect with the firm of Fleischman/Garcia located in Tampa, Florida stated that fire station construction must comply with the ADA (Americans with Disabilities Act, 1992). Even though the workers don't have disabilities, a fire station is a public building and therefore must comply. (Fleischman/Garcia)

All fire department facilities shall comply with all legally applicable health, safety, building, and fire code requirements. (NFPA 1500, 7-1.1 Safety Standards)

Fire Departments shall provide facilities for disinfecting, cleaning, and storage in accordance with NFPA 1581, Standard on Fire Department Infection Control Program. (NFPA 1500, 7-1.2 Safety Standards)

All existing and new fire stations shall be provided with smoke detectors in work, sleeping, and general storage areas. When activated, these detectors shall sound an alarm throughout the fire station. (NFPA 1500, 7-1.3 Safety Standards)

All existing and new fire department facilities shall have carbon monoxide detectors installed in sleeping and living areas. (NFPA 1500, 7-1.4 Safety Standards)

One of the safety concerns needing to be addressed is the extraction of exhaust from the vehicles on the apparatus floor. Source extraction gear that attaches directly to the apparatus is one option, and the more traditional exhaust fan system is another. (Elliott, 1999, pg. 4)

The fire department shall prevent exposure of firefighters and contamination of living and sleeping areas to exhaust emissions. (NFPA 1500, 7-1.6) One type of

ventilation system that meets these criteria utilizes low to the ground up-ducts on the apparatus floor that vent out the roof. (Fleischman/Garcia)

Both the National Institute for Occupational Safety and Health (NIOSH) and the U.S. Occupational Safety and Health Administration (OSHA) have declared human exposure to diesel exhaust as a potential occupational carcinogenic (cancer-causing) hazard through toxicological studies. In 1985 the International Association of Firefighters (IAFF) commissioned a study involving the measurement of diesel exhaust emissions at selected fire stations. From these findings, the IAFF study concluded: “Even with the uncertainties in the reported studies, apparent prudent health practices would require that steps be taken to limit firefighter exposure to diesel emissions.” (FA 168, 1997, pg. 62, 64)

Various methods have been suggested for reducing diesel exhaust emissions at fire stations. These possible solutions take three different forms:

1. *Engineering controls* involve methods which reduce the amount of toxic substances released by the diesel engine.
2. *Ventilation* increases the flow of clean air to affected areas by adding apparatus room exhaust fans and in some cases providing a “positive pressure” in the living and work areas.
3. *Source Capture* entails placing collection systems directly on the apparatus tail pipe and venting the emissions harmlessly into the atmosphere. (FA 168, 1997, pg. 64, 65)

All fire department facilities shall be inspected at least annually to provide for compliance with section 7-1 of this chapter. Inspections shall be documented and

recorded. (NFPA 1500, 7-2.1 Inspections)

All fire department facilities shall be inspected at least monthly to identify and cause correction of any health or safety hazards. (NFPA 1500, 7-2.2 Inspections)

The fire department shall have an established system to maintain all facilities, and to cause prompt correction of any health or safety hazards or code violations. (NFPA 1500, 7-3.1 Maintenance and Repairs)

In 1989 the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) made a change to code 62-89. This change increased the amount of outside air to be circulated in a structure from 5 cubic feet per minute (CFM) for each person up to 15 CFM. The air conditioning unit would have to be much larger, especially in southwest Florida to deal with the increased amount of hot air and humidity. (Fleischman/Garcia)

The South Florida Building Code was rewritten as a result of the devastation hurricane Andrew unleashed on south Florida. One provision of the new Code is a large and small missile criteria, requiring a new structure withstand penetration of a two by four piece of lumber at a speed of 37 miles per hour. (Fleischman/Garcia)

### Research Question 3:

**What are Fire departments in Pinellas County doing to meet their fire station needs?**

In order to determine what other Fire Departments in Pinellas County were doing to meet their needs regarding building and/or refurbishing stations, tours of their new or updated stations were scheduled. Saint Petersburg, Largo, and East Lake had either built a new station or had undertaken a station refurbishment project in the past two

years.

In East Lake, care was given so the exterior of Station 56 would blend well with the neighborhood. Wayne Hughes, of Hughes Group Architects in Sterling, Virginia, states, “People have this image of fire stations as being loud, with a lot of light, a lot of sound, a lot of radios. But fire and rescue services have changed dramatically in the past ten years, with the use of pagers and the ability to damp down sirens and lighting. In many ways, they’re better than they used to be.” (Elliott, 1999, pg. 3)

Largo took advantage of a grant to pay for padded flooring in the exercise room at Station 41. The flooring is a by-product of shredded tires. (Deputy Chief Jim Collins, Largo Fire Department)

Stations 3 and 13 in Saint Petersburg utilized art on the exterior of the stations to make them more attractive to the neighbors. Station 13 has a very modern artwork that lights up at night and is supposed to resemble a moving fire engine as you drive by the station. Station 3 has some old style fire apparatus incorporated into the building’s brickwork.

The City of Largo designed its master Station 41 to better cope with a hurricane. Some of the items they included were:

- Wind rated overhead doors, with extra sturdy hangers and tracks
- Potable water tank (1000 gallons) outside the structure
- Larger generator mounted outside the structure (60 kilowatts)
- Roll-up shutters

All of the stations had professionally landscaped grounds, which added to the neighborhood scheme.

## **PROCEDURES**

The procedure used in preparing this research brief began with an extensive literature review at the Learning Resource Center at the National Emergency Training Center in June of 1999. Additional literature reviews were conducted at the City of Clearwater Public Library in Clearwater, and the Clearwater Fire and Rescue (Employee Development) Library, also in Clearwater, and were completed by December of 1999. The review of available literature from these sources included magazines, and available applied research projects. A search for available information on the Internet over a period of time during the months of September, October, and November of 1999 also took place.

The author also toured new and recently refurbished fire stations, in Pinellas County, Florida. These tours took place in July of 1999 and included a team of Clearwater Fire and Rescue members. Members who toured the stations included: Assistant Chief Jack Callahan, Deputy Chief Jerry Worsham, District Chief Dean Edwards, Driver Operator Garry Wigington, Lead-Medic William Gillette, and myself. Ideas the committee liked, and wished to incorporate into future stations are captured in Appendix C. These tours included new stations in the following Cities: Saint Petersburg (stations 3 & 13), Largo (station 41), and East Lake (station 56). A refurbishment project in Saint Petersburg (station 4) was also visited. All of the above construction projects had been completed in the past two years.

The author conducted an interview with John C. Kelly, a Senior Associate of Fleischman/Garcia, a local architecture, planning, and interior design firm. Questions asked during these interviews were limited to the research questions from this paper.

### **Assumptions**

The procedures used to complete the research project include an assumption that the stations visited complied with applicable fire and building codes.

### **Limitations**

Due to the limited number of current resources available on the subject of fire station design, the author visited local recently constructed fire stations and interviewed an architect familiar with fire station design.

### **Definition of Terms**

ADA	Americans with Disabilities Act
ALS	Advance Life Support
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
CFM	Cubic feet per minute
IAFF	International Association of Firefighters
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
OSHA	U.S. Occupational Safety and Health Administration
SOG	Standard Operating Guidelines

## RESULTS

### **1. What design changes have taken place over the last twenty years to improve station functionality?**

The number of female personnel has dramatically increased over the last twenty years and fire station design has changed to address this. For the most part, these changes have affected restroom and dormitory facilities. Station visits showed an overwhelming preference toward gender-neutral restrooms.

The emphasis now is toward compartmentalized space, whether it be restrooms or dorms. (Elliott, 1999, pg. 4,5) Station tours confirmed this in all but one station (Station 4, St. Petersburg). At Station 4, the restrooms for males and females were large, separate rooms of equal size with the same number of fixtures in each.

All stations visited had convenient decontamination areas with access off the apparatus room floor.

A physical training room is a priority now. "They like to have all mirrors on the wall and the latest exercise equipment." (Elliott, 1999, pg. 5) All the stations visited had a separate room with an assortment of exercise equipment.

Today's fire station kitchens are larger and more functional. All the stations visited utilized separate refrigerators and pantries for each of the three shifts.

Apparatus floors in the visited stations had received an application of a non-slip texture. Largo's station 41 used a more expensive epoxy floor coating.

Sprinkler systems were found in all the stations visited.

The use of security systems was non-existent. Proper lighting was provided in the parking lot areas to reduce vandalism.

## **2. To what guidelines must new station construction or refurbishment adhere?**

The majority of guidelines referring to fire station construction come from the National Fire Protection Association's (NFPA) 1500 Series, The Standard on Fire Department Occupation Safety and Health Program, Chapter 7 (Facility Safety), 1997.

The system of choice for the extraction of exhaust at the visited stations was the ventilation method, through the use of exhaust fans.

In order to meet N.F.P.A. 1500, 7-2.1 regarding annual facility inspections, a station inspection form, entitled the "Clearwater Fire and Rescue Facilities Checklist" was developed in July of 1999, and is recognized as Appendix A. The checklist prompts the inspection team to thoroughly examine the: general work environment, environmental controls, apparatus floor and vehicles, station equipment, fire prevention and protection systems, electrical systems, and general housekeeping.

Use of sprinkler systems, smoke detectors, and carbon monoxide detectors was universal at the stations toured.

Fire station construction must comply with the Americans with Disabilities Act to accommodate individuals with disabilities. Also, construction must adhere to the South Florida Building Code and the American Society of Heating, Refrigeration and Air Conditioning Engineers' requirements.

## **3. What are Fire Departments in Pinellas County doing to meet their needs?**

Valuable information was obtained during the tours of the fire stations built or refurbished within the past two years in Pinellas County.

All the stations had utilized individual cubicles for dorm areas, containing one bed, three lockers, and a desk. John Kelly stated a pull curtain for the doorway enhances privacy, yet is unlike a solid door where you have less control over inappropriate behavior. (Fleischman/Garcia) One station had pull curtains across the cubicle openings, one used hollow core doors, and three stations choose not to utilize any door or covering on the cubicle opening. The stations in Largo and Saint Petersburg limited wall height to six feet for dormitory cubicles.

A list of features in the new stations which the Clearwater Fire and Rescue personnel on the tour found interesting has been identified as “Building Prerequisites” and is included in Appendix B.

Station design from the exterior was in accordance with surrounding neighboring structures, with attractive landscaping and building art.

All of the visited stations were equipped with generators for emergency power needs. Station 41 in Largo had incorporated many features in preparation for a potential hurricane.

## **DISCUSSION**

When reviewing the information gathered through literature review, station inspections, and interviews, it was clear they were all in agreement regarding the options in fire station design and construction.

Wayne Hughes states the trend in sleeping quarters is toward modular design to accommodate both shift and gender flexibility. Mr. Hughes says, “It allows the Fire Chief to shuffle the personnel very easily. Gone is the day of large bunk rooms. Now we have modular bunk rooms that address the varying numbers of fire and rescue

personnel. Obviously, the dramatically increased number of women who are in this field is a keynote of the design.” (Elliott, 1999, pg. 6)

It was noted while visiting the five fire station construction projects in Pinellas County, that all had used separate cubicles for dormitories. Clearwater Fire and Rescue built its newest station in 1978 and at that time employed all male firefighters. All six of Clearwater’s fire stations utilize a large dorm design, with separate sleeping quarters for officers only.

In the Clearwater Fire and Rescue Department Fire Services Management Study Final Report, it states our facilities are inadequate for almost every function related to 24 hour emergency service. Dormitories and restrooms do not accommodate the privacy considerations that are necessary for male and female firefighters, nor do they meet ADA requirements. (Knopf, 1998, pg.33)

It is obvious to the author that construction of future stations or refurbishment projects must incorporate the individualized dormitory and restroom design.

There were no unusual findings in the area of apparatus floors at the stations visited. The floors were similar and slip resistant. Fire apparatus bay areas are finished with a smooth concrete surface and then given a seal coat. Serious consideration should be given to the need for non-slip surfaces which reduce the potential for slip/trip injuries. The apparatus floor is frequently wet and firefighters are moving quickly, mounting and dismounting apparatus. (FA 168, 1997, pg. 49)

“Fire stations are supposed to be an example for others when it comes to fire protection,” states Katia Thomas. (Elliott, 1999, pg. 6) Due to the fact the City of

Clearwater mandates sprinklers in many types of construction, the Fire Department should lead by example and utilize sprinkler systems in its own facilities.

For the most part, the stations visited are located in residential areas and security to date has not been as issue. “The firehouse of yesteryear, open to all comers 24 hours a day, is a thing of the past. We lock down our stations tight during a call,” states Scott Pirnak of Pahl-Pahl-Pahl Architects/Planners of Denver. (Elliott, 1999, pg. 6) Clearwater Fire and Rescue has a policy to secure our stations prior to departing, and is in agreement with information found in the literature review.

Clearwater Fire and Rescue currently utilizes the ventilation removal system performed with exhaust fans. The stations visited used the ventilation method in conjunction with providing a “positive pressure” in the living and work areas, which increases the flow of clean air. (FA 168, 1997, pg. 64) Adding the “positive pressure” component to the ventilation method we use would provide a superior ventilation system in future stations.

Fire Departments that provide emergency medical operations shall provide or have access to disinfecting facilities for the cleaning and disinfecting of emergency medical equipment. Design disinfecting facilities in stations with proper lighting, separate ventilation to the outside environment, fitted with floor drains connected to a sanitary sewer system, and to prevent contamination of other station areas. (FA 168, 1997, pg. 76, 77)

The toured stations utilized a room directly off the apparatus floor to encourage decontamination prior to entering the living areas of the station.

Mitch Connor states, “When we’re designing a station, we think about the

firefighters' actual path of travel back into the station." (Elliott, 1999, pg. 4)

Clearwater Fire and Rescue must make improvements in the area of decontamination. These improvements will be easily worked into the design plan of future construction projects. Training and education must also take place; it is no longer appropriate for clean-up to take place in the kitchen sink.

Since developing the Clearwater Fire and Rescue Facilities Checklist (Appendix A), all six of Clearwater's Fire Stations have been formally inspected. This form will not only aid in the compliance of health and safety issues, it also gives the inspector(s) an opportunity to evaluate the condition of equipment and station furnishings. Ample space is provided on this form to gather input and suggestions from the personnel living at these stations, in an effort to improve conditions.

Construction must comply with local, building, fire, and health and safety code requirements.

I was impressed with Station 41 in Largo and the planning that was done for hurricane preparedness. All of Clearwater's Fire and Rescue Stations are equipped with shutters, but they must be manually installed. Roll-up shutters would be a great time saver and extremely beneficial for our Clearwater Beach Station and the possible future Sand Key location. The shutters help secure the stations prior to the crews' evacuation to the mainland. The five existing stations on the mainland house additional City employees from Public Works and the Police Department during a hurricane and a potable water tank would be very beneficial in future planning. I liked how Largo had their generator outside the building to reduce noise. "Station design attributes important in avoiding damage during sever storms such as those associated

with hurricanes include specially reinforced walls, reinforced roofs, and structural connections.” (FA 168, pg. 86) Largo utilized these attributes and the impact to our City would be increased construction costs.

## **RECOMMENDATIONS**

With regard to question #1 and the accompanying findings, it is recommended that Clearwater Fire and Rescue utilize a station design plan that calls for individual dormitory rooms. The current large dorm environment is out dated and does not accommodate a coed work force. Personnel are on duty for twenty-four hours at a time and need to have an opportunity to have some privacy. I recommend rooms with floor to ceiling walls that have a hollow core door. Each dorm should contain four eight-foot high lockers, which would provide adequate storage for personnel who need to move station to station due to others’ absences or scheduled time off. Each dorm would also have a desk built into one wall, a chair, and a bed.

Gender neutral bathrooms are recommended in order to address our increasing number of female personnel. This in conjunction with private dorms should improve the current work environment and increase morale.

Ample space should be provided for physical fitness equipment. Currently the exercise equipment we have at the stations is placed in large dorm rooms or training rooms that are forced to serve a dual purpose. The addition of a separate room would make working out less of an imposition on others.

Kitchens do not need to be extravagant. Separate pantry areas and plenty of cabinet space for each of the three shifts should be provided.

I was impressed with the epoxy floor coating Largo used at Station 41 on its apparatus bay floor. I recommend using it, but we need to follow up with Largo at a later date in order to assess the coating's durability. Station 41 was only two months old when we visited. Our goal is to reduce the risk of injuries by using a superior floor coating on the apparatus bay floor.

With regard to question #2 and the findings, compliance with NFPA 1500 greatly adds to quality of life and addresses numerous safety concerns.

A decontamination area must be provided. The decon area should be conveniently located off the apparatus floor and utilized when appropriate prior to entering the living quarters. This is easy to address during new construction and refurbishment projects, but some modifications need to be made now for existing stations. Jim Fogarty, Deputy Chief of Emergency Medical Services for Clearwater Fire and Rescue, is taking the lead on this modification study. This is a safety issue and impacts the health and safety of all employees.

Clearwater Fire and Rescue currently utilizes sprinkler systems, smoke detectors, and carbon monoxide detectors in all its stations; we plan to continue their use in all future projects. The safety of our personnel is our number one priority.

We have just recently initiated a formal station inspection program. The form we developed to document these inspections is the "Clearwater Fire and Rescue Checklist." (Appendix A) Over a period of years, this form could prove useful during the budget process by providing data that predicts the life expectancy of equipment and furnishings at the stations. District Chiefs can utilize the form for a quarterly inspection

program, and Station Lieutenants on a monthly basis. The form is designed as a living document to be modified as necessary.

Clearwater Fire and Rescue must address improving the extrication of exhaust from the vehicles on the apparatus floor. I recommend continued use of exhaust fans with the addition of a positive pressure component, thus adding to the health and safety of personnel.

With regard to question #3 and the findings, I recommend future stations be designed and built with the possibility of a hurricane strike as a risk factor. Clearwater is located on the west coast of Florida, bordered on the west by the Gulf of Mexico and on the east by Tampa Bay. Every hurricane season, severe tropical storms and hurricanes threaten our area. Wind rated overhead doors with extra sturdy hangers and tracks should be utilized on apparatus bays. Roll up shutters, an outside generator, and a potable water tank are recommended items as well. Our personnel are extremely busy doing evacuations and handling emergency calls during a hurricane situation and they should not have to worry about the structure in which they are housed. Undoubtedly, this will add to the cost of future projects, but we will be ready to respond after a storm if the fire station is a safe structure.

All our stations will require extensive refurbishment or replacement over the next decade. An effort must be made to continually update design plans as new ideas are introduced, and codes and guidelines change.

Once approval for a new station or refurbishment project is given to Clearwater Fire and Rescue, I recommend we bring our station-touring group together at a meeting

with the builder and architect for a “brain storming” session. We have a lot to learn, but input from those who will actually live in the station should be beneficial.

In conclusion, my recommendation for individuals who may wish to replicate this study would be two fold. First, utilize the most current edition of the NFPA 1500 Series as a design guide to address health and safety issues. Second, coordinate your project with a reputable architect, familiar with fire station design.

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## APPENDIX A

## Clearwater Fire & Rescue Facilities Checklist

This checklist will provide direction for company officers to conduct inspections of their particular facilities on a monthly basis.

**I. GENERAL:**

- ☐ The required Federal, State, and City workplace posters shall be displayed in the station, as required, where all employees are likely to see it.
- ☐ Emergency instructions and telephone numbers shall be available for the general public in the event of an emergency and fire personnel are out of quarters.
- ☐ Station Call Boxes clean and operating properly.
- ☐ Keys available to access all areas of the station.

**II. HOUSEKEEPING:**

- ☐ All rooms, offices, hallways, storage rooms, and the apparatus floor shall be kept clean and orderly and in a sanitary condition.
- ☐ All hallways and/or passageways shall be free from any type of protruding objects such as nails, splinters, and holes.
- ☐ All waste containers shall be emptied regularly.
- ☐ Waste containers shall be provided in the kitchen and/or eating areas.
- ☐ All areas of the station shall be adequately illuminated.
- ☐ Stairways shall be in good condition with standard railings provided for every flight having four or more risers.
- ☐ No storage under stairwells.
- ☐ Portable ladders shall be adequate for their purpose, in good condition, and have secure footing.
- ☐ Fixed ladders shall be equipped with side rails, cages, or special climbing devices.
- ☐ Smoking shall not be permitted in designated no-smoking areas.
- ☐ Containers of all cleaning agents shall be carefully labeled per the 1910.1200 standard of VOSH standards.
- ☐ First-aid supplies shall be available and clearly identified as to location.
- ☐ Shower curtains should provide adequate protection to prevent floors from becoming excessively wet and slippery.
- ☐ Cooking appliances and eating utensils should be kept clean and in good working order.
- ☐ No unauthorized personal items.
- ☐ Station Library neatly maintained.
- ☐ Inspect furniture.

**III. EXITS**

- ☐ All exits shall be visible and unobstructed.
- ☐ All exits shall be marked with a readily visible sign that is illuminated.
- ☐ Doors that might be mistaken for exits shall be marked –“Not an Exit.”

- \_\_\_\_ Exits and exit signs shall be free of decorations, draperies, and/or furnishings.
- \_\_\_\_ Primary exit routes shall be obvious, marked, and free of obstructions.
- \_\_\_\_ Exits should be wide enough for easy access.

#### **IV. WALKING AND WORKING SURFACES:**

- \_\_\_\_ Floors shall be kept as clean and dry as possible.
- \_\_\_\_ Adequate lighting shall be provided in all working areas.
- \_\_\_\_ Fire fighters' routes to slide pole or to apparatus shall be completely free of projections, tripping hazards, loose objects, or other impediments.
- \_\_\_\_ Beds shall be located as to result in minimum interference during turnout of fire fighters.
- \_\_\_\_ Handrails shall be of sufficient strength and proper design for all stairways and floor openings.
- \_\_\_\_ All slide pole floor openings shall be provided with safety enclosures.
- \_\_\_\_ A safety mat shall be positioned at the bottom of the slide pole.
- \_\_\_\_ The slide pole shall be regularly inspected and maintained.

#### **V. APPARATUS FLOOR AND MAINTENANCE AREAS:**

- \_\_\_\_ Ladders, pike poles, and other items projecting from the apparatus shall be clearly marked with bright colored flags, stripes, or other identification to warn against "headbump" accidents.
- \_\_\_\_ Apparatus overhead doors shall be maintained in a safe, operating condition.
- \_\_\_\_ Apparatus doors shall have adequate space for proper clearance for vehicles.
- \_\_\_\_ Personnel shall wear eye protection when working under vehicles.
- \_\_\_\_ In relation to the previous question is eye protection provided, is it in good condition, and is it used?
- \_\_\_\_ All power tools shall have proper guarding for electrical, cutting, and moving parts.
- \_\_\_\_ Maintenance hand tools shall be safely stored when not being used. They shall be inspected periodically and maintained to assure their safe condition.
- \_\_\_\_ Unsafe conditions to check are as follows:
  - \_\_\_\_ The tools shall be clean.
  - \_\_\_\_ The handles/grips shall not be broken.
  - \_\_\_\_ There shall be no worn, defective points/parts on the tool.
  - \_\_\_\_ There shall be no part missing.
  - \_\_\_\_ Pulleys and belts shall be properly guarded.
  - \_\_\_\_ Chain drives and sprockets shall be guarded.
  - \_\_\_\_ A spotter shall be used when vehicles are backed up.
  - \_\_\_\_ On-board battery conditioners plugged in while in quarters.

#### **VI. FIRE PREVENTION AND PROTECTION:**

- \_\_\_\_ Portable fire extinguishers shall be maintained in a fully operable condition and kept in designated places when not in use. They shall be inspected on a monthly basis.
- \_\_\_\_ Fire extinguishers shall be of the proper type for the expected hazards.
- \_\_\_\_ The fire extinguisher shall have a durable tag securely attached to show the maintenance or recharge date. Also, the initials or signature of the person and/or company who performed the inspection shall be on the tag.

- \_\_\_\_\_ The fire alarm system shall be tested on a yearly basis, if the station is so equipped.
- \_\_\_\_\_ If the station is so equipped, a qualified person shall service the sprinkler system.
- \_\_\_\_\_ The minimum amount of clearance, 18 in. (45.7 cm) shall be maintained below the sprinkler head.
- \_\_\_\_\_ Smoke detectors, which are in stations not equipped with a fire alarm system, shall be tested the first Tuesday of each month.
- \_\_\_\_\_ All ceiling tiles are to be in place and intact.
- \_\_\_\_\_ Range hood extinguisher system to be inspected yearly.
- \_\_\_\_\_ CO monitor/s in place and working properly.

#### **VII. HAZARDOUS MATERIALS:**

- \_\_\_\_\_ Cylinders of compressed gases shall be stored in an upright position away from combustible materials.
- \_\_\_\_\_ Flammable and combustible materials shall be stored in tanks or closed containers per NFPA 30, Flammable and Combustible Liquids code.
- \_\_\_\_\_ Safety containers with self-closing lids shall be used for the storage of flammable liquids and soiled, oily rags.
- \_\_\_\_\_ Gasoline and diesel pumps shall be checked on a weekly basis for proper working order and the condition of the nozzles and hoses.

#### **VIII. ELECTRICAL WIRING, FIXTURES, AND CONTROLS:**

- \_\_\_\_\_ Electrical cords shall be strung so that they do not hang on pipes, nail hooks, and so forth
- \_\_\_\_\_ Conduit shall be attached to all supports and tightly connected to junction and outlet boxes.
- \_\_\_\_\_ All electrical cords shall be checked for fraying.
- \_\_\_\_\_ All equipment shall be securely mounted to the surface on which it sits.
- \_\_\_\_\_ Flexible cords and cables shall not be used as a substitute for fixed wiring.
- \_\_\_\_\_ All extension cords shall be properly grounded and approved.
- \_\_\_\_\_ All electrical tools, whether department owned or personnel property, shall be properly protected for damaged power cords, plugs, worn switches, defective ground circuits, or other faults that could render them unsafe for use.
- \_\_\_\_\_ Electrical switches and circuit breakers shall be marked to show their purpose.

#### **IX OTHER:**

- \_\_\_\_\_ Portable heaters used in stations shall be placed out of travel routes and away from combustibles, and if turned over, they shall turn themselves off.
- \_\_\_\_\_ Any situations that warrant a concern shall be brought to the attention of the health and safety officer.

**X COMMENTS/EXPLANATIONS:**

## Clearwater Fire & Rescue Station Inspection Form

Station \_\_\_\_\_

Date \_\_\_\_\_

Shift \_\_\_\_\_

Inspected By: \_\_\_\_\_

Officer responsible for corrections: \_\_\_\_\_

Answer all questions with yes or no. Explain any no answers.

Comment on the bottom of the page.

### General Work Environment

\_\_\_\_ Are all work sites clean and orderly?

\_\_\_\_ Are all work surfaces kept dry or appropriate means taken to assure the surfaces are slip-resistant?

\_\_\_\_ Are all combustibles stored properly:

\_\_\_\_ Are all bathroom facilities clean and sanitary;

\_\_\_\_ Is the kitchen clean and sanitary?

\_\_\_\_ Is the day room clean?

\_\_\_\_ Are the sleeping quarters clean?

\_\_\_\_ Are there proper labels on all containers?

\_\_\_\_ Are the apparatus bay and workroom clean?

\_\_\_\_ Is the outside of the station clean and cared for?

\_\_\_\_ Are station log and all computer reports (NFERS, Training) up to date and correct?

\_\_\_\_ Condition of furniture.

**Comments:**

### Environmental Controls

\_\_\_\_ Are all electrical fixtures working:

- \_\_\_ Is the A/C working properly?
- \_\_\_ Are the A/C filters clean?
- \_\_\_ Are there any combustibles around the furnace or hot water heater/s?
- \_\_\_ Is the vent-hood over the range clean?
- \_\_\_ Are the air-conditioning thermostat covers in place?
- \_\_\_ Are all station exhaust fans working?
- \_\_\_ Are floor drains clean and draining properly?
- \_\_\_ Are all fire extinguishers up to date?
- \_\_\_ Are smoke detectors working?
- \_\_\_ Are material safety data sheets up to date?
- \_\_\_ Are extension cords used as permanent wiring?
- \_\_\_ Are station CO detectors in place and working properly?

**Comments:**

**Apparatus**

Apparatus Number/s \_\_\_\_\_

- \_\_\_ Are all apparatus tires safe?
- \_\_\_ Is there broken or defective glass in any apparatus windows?
- \_\_\_ Are all lights on apparatus working (i.e., red lights, working lights, headlights, taillights, marker lights, and so forth)?
- \_\_\_ Is apparatus clean?
- \_\_\_ Is all equipment on apparatus and working property?
- \_\_\_ Are all apparatus checks and paperwork up to date and filled out properly (log books)?
- \_\_\_ Is apparatus ready to respond? (Ask Lieutenant)
- \_\_\_ Is medical equipment clean and inspected?
- \_\_\_ Are all seat belts in place and working?
- \_\_\_ Are all safety gates in place and working?
- \_\_\_ Are all intercom headsets in place and working?
- \_\_\_ Are portable radios in place and working properly?
- \_\_\_ Is the mobile radio working properly?
- \_\_\_ Are map books on apparatus and up to date?
- \_\_\_ Are building surveys on apparatus and up to date?
- \_\_\_ Are airpack restraint straps in place and properly latched?

- \_\_\_ Is fire fighter's bunker gear in place and clean?
- \_\_\_ Are the correct accountability tags properly mounted on the board.
- \_\_\_ Battery conditioner "plugged in".

**Comments:**

#### **Station Equipment**

- \_\_\_ Computer software
- \_\_\_ Microwave functions correctly
- \_\_\_ Grill functions correctly
- \_\_\_ Stove/Oven operate correctly

**Comments:**

State Posters:      Fair Employment E+S  
                         Hazardous Chemicals  
                         Minor Labor Law  
                         OSHA/Healthcare  
                         Unemployment Insurance  
                         Workers Compensation

## APPENDIX B

### **Building prerequisites**

- Individual tones for rescue and rest of station
- Individual cubicles for personnel
- Decon room with washer/dryer
- Roll up shutters
- Wind rated overhead doors
- Ceramic tile with curb roll
- Deep recess on overhead doors for sun shade
- 16' bays with 14' doors
- Exterior remote pickups for remote door openers
- Screened patio under roof
- Kitchen island
- Phone jacks in dorms
- "Travelers" lockers
- Better lockers with partitions, drawers, hanging area w/overall height of 8'
- Apparatus floor painted with tested paint (no peel)
- Overhead doors with extra-sturdy hangers and tracks
- Stop lights for overhead doors
- Second photo cell for aerial bays to line up on booms or bucket in front of cab
- Plenty of closet space and large kitchen pantries
- Larger generator mounted outside structure
- Potable water tank (1000 gallons) outside structure
- Building art